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Evaluation of ^{99}Tc Drinking Water Dose for Oxidizing Sorption Coefficient in the Tank Grout

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1. Portage Project No.: 2121.00 2. Project/Task: Tank Farm Facility

3. Subtask: Performance Assessment

4. Title: Evaluation of ^{99}Tc Drinking Water Dose for Oxidizing Sorption Coefficient in the Tank Grout

5. Summary:

The effect on drinking water dose for ^{99}Tc using an oxidizing grout sorption coefficient was evaluated. The ^{99}Tc groundwater concentration peak arrives at 842 years for the oxidizing sorption coefficient in comparison to a peak groundwater concentration arrival time of 14,590-year post-closure for the reducing grout sorption coefficient. The groundwater arrival time coincides with the ^{129}I peak resulting in a combined drinking water dose of 1.3 mrem/yr. However, the total drinking water dose for the Tank Farm Facility dose would not exceed the drinking water performance objective of 4 mrem/yr.

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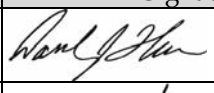
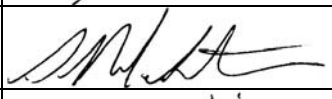
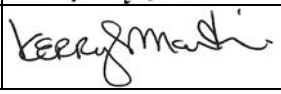
Author	A	Dave Thorne		08/01/05
Independent Review	R	Nick Stanisich		08/01/05
Project Manager	R/A	Kerry Martin		08/01/05

CONTENTS

1. INTRODUCTION

The Performance Assessment (PA) (DOE-ID 2003) for the Tank Farm Facility (TFF) evaluated the groundwater drinking water doses for ^{99}Tc using a reducing sorption coefficient of 2,500 mL/g. This resulted in a peak release of ^{99}Tc from the tank/vault system at 12,206 years post-closure and a peak drinking water dose of 0.12 mrem/yr at 14,590 years post-closure.

The sorption coefficient for ^{99}Tc in grout varies between oxidizing and reducing conditions. Therefore, the effect on the drinking water dose presented in the PA for ^{99}Tc was evaluated using an oxidizing grout sorption coefficient. The grout sorption coefficient (i.e., K_d) for oxidizing conditions varies between 0.001 and 0.01 m^3/kg according to Bradbury and Sarott (1995). Therefore, similar to the TFF PA methodology, the midpoint of the range was assigned for the conservative (i.e., compliance case) with a value of 0.05 mL/g. For comparison, the reducing K_d for ^{99}Tc is 2,500 mL/g. The TFF PA assumed an oxidizing vault K_d at the low end of 0.001 m^3/kg. The vault value was assumed to be the same as used in the PA for this analysis.

2. RESULTS

The resulting groundwater drinking water doses are provided in Figures 1 and 2.

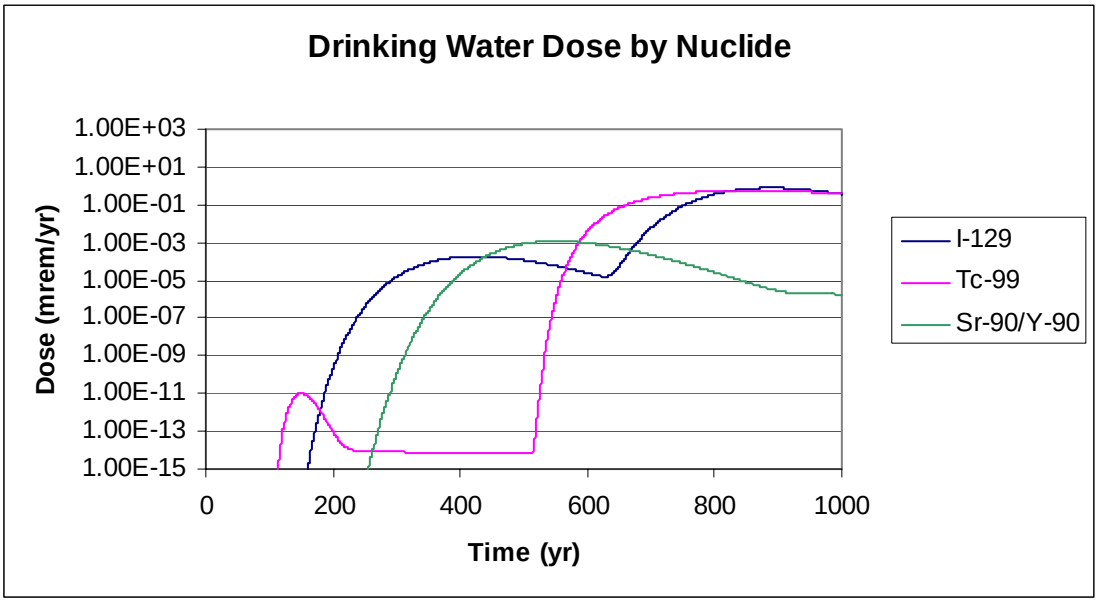


Figure 1. Drinking water doses for individual radionuclides (^{99}Tc oxidizing grout K_d).

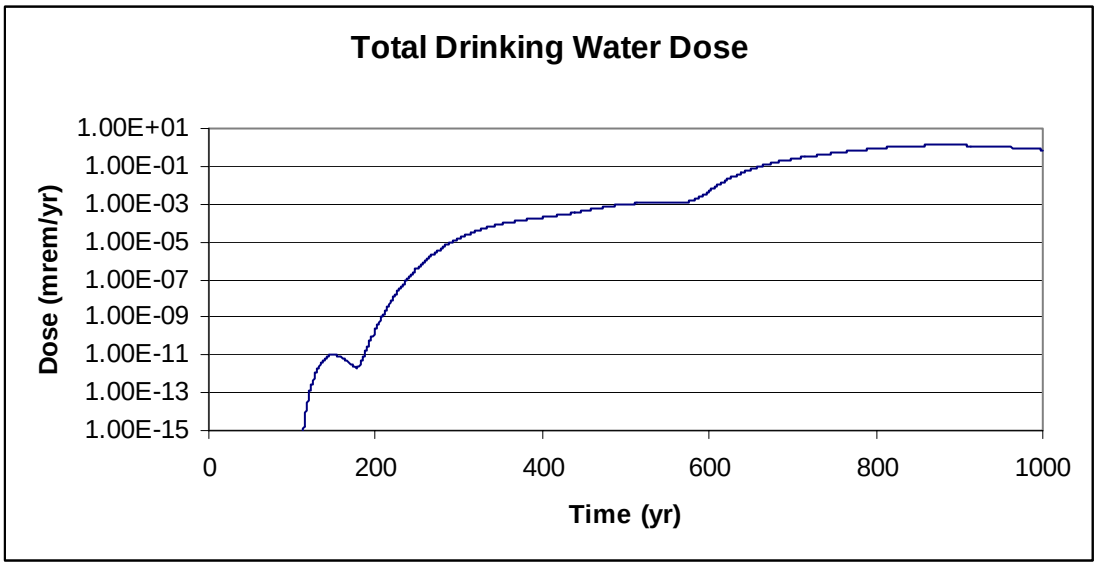


Figure 2. Total drinking water doses for individual radionuclides (^{99}Tc oxidizing grout K_d).

The total drinking water dose increases to a value of 1.3 mrem/yr for Tank WM-182 with a ^{99}Tc inventory of 0.764 Ci. All other inventories for ^{99}Tc in the sandpad and the other radionuclides in the sandpad and tanks were held at their original values from the TFF PA.

The ^{99}Tc tank peak drinking water dose occurs at 842 years at a dose of 0.54 mrem/yr. The total drinking water dose peaks at 874 years due to the combined doses from ^{99}Tc and ^{129}I. The drinking water dose contributions from ^{99}Tc and ^{129}I to the total drinking water dose at this time are 0.54 and 0.76 mrem/yr, respectively.

3. CONCLUSIONS

The effect on drinking water dose for ^{99}Tc using an oxidizing grout sorption coefficient was evaluated. The ^{99}Tc groundwater concentration peak arrives at 842 years for the oxidizing sorption coefficient in comparison to a peak groundwater concentration arrival time of 14,590-year post-closure for the reducing grout sorption coefficient. The groundwater arrival time coincides with the ^{129}I peak resulting in a combined drinking water dose of 1.3 mrem/yr. However, the total drinking water dose for the TFF dose would not exceed the drinking water performance objective of 4 mrem/yr.

4. REFERENCES

Bradbury, M. H., and F. A. Sarott, 1995, *Sorption Databases for the Cementitious Near-Field of a LLW Repository for Performance Assessment*, Paul Scherrer Institute, March 1995.

DOE-ID, 2003, *Performance Assessment for the Tank Farm Facility at the Idaho National Engineering and Environmental Laboratory*, DOE/ID-10966, Revision 1, U.S. Department of Energy Idaho Operations Office, April 2003.